A PROPOSAL FOR COOPERATIVE WILDLIFE RESEARCH INSTITUTES AT CANADIAN UNIVERSITIES

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Over 15 million Canadians spent an estimated $4.2 billion in 1981 participating in activities related to wildlife (Filion et al. 1983). The economic impact of these personal expenditures is significant. Taking account of the multiplier effect, they contribute $8.8 billion to Canada's gross business production and support 185,000 jobs annually (Filion et al. 1985). These significant contributions account for a substantial segment of the $18 billion tourist industry. International tourism alone is valued at $4 billion. Wildlife, scenery and outdoor activities were rated by European travellers as important reasons in selecting a vacation in Canada (Tourism Canada 1985). In addition, wildlife contributes substantially to the subsistence of significant numbers of people in Canada. Those impressive figures would be even larger if expenditures relating to wildlife by non-residents and subsistence use of wildlife by natives were included. For example, the meat of caribou used by native people in northern Canada is valued at $65 million annually (Thomas 1985) and the non-resident trophy hunting of caribou in Quebec is valued at $10-15 million (Jackson 1985).

Wildlife is a renewable resource; if it is managed properly the economic benefits that it yields can be sustained indefinitely. Wildlife populations and their habitats are, however, being affected as never before by agriculture, forestry, industrial development and indeed by most human activities. Many wildlife populations are under stress and wildlife habitats are declining in quality and quantity; thus, much of the socio-economic benefit derived from wildlife is at risk or has already declined. For example, the fall flight of mallards declined 40 percent between 1978 and 1985 resulting in the loss of 10,000 jobs and $200 million

in expenditures associated with waterfowl hunting (J.H. Patterson pers. comm.). This economic loss is concentrated in rural Canada which would benefit most by enhanced wildlife-related economic opportunities to diversify the agricultural economy. The viability of this multi-million dollar industry depends on careful conservation and management of wildlife and their habitats and that, in turn, requires sound knowledge based on high quality, broadly defined research programs. It is not enough to be knowledgeable about wildlife itself; it is also necessary to understand the interactions among the different species and their habitat requirements, and to be aware of the effects of human use on the various species and their habitats. The responsibility for management of non-migratory wildlife is largely that of the provincial and territorial governments, but the federal government has some specific responsibilities and a broad mandate to support wildlife research.

Although scientific information is fundamental to the wise use of wildlife resources and their habitats, the ability to conduct effective research in Canada is in jeopardy because of spending restraints. Generally, government funding of research to improve management of wildlife resources is being reduced, not increased (Pollard and McKechnie 1986).

Thus there is an increasing need for research and the present trend to reduce government sponsored research makes it essential to seek new arrangements for research. One possible and potentially important new thrust would be through cooperation of both levels of government with the academic community and the private sector. One possible mechanism for achieving this cooperation is the formation of Cooperative Wildlife Research Institutes at Canadian universities. The Institutes would have

two key characteristics; they would be interdisciplinary and they would be financed by a consortium of supporters. The concept is that a Cooperative Wildlife Research Institute would combine skills of agronomists, biologists, botanists, economists, foresters, geographers, hydrologists, range scientists, social scientists, veterinarians, zoologists and others from university and government agencies, to provide cost effective, high quality research supported by governments, industry and private foundations as well as the universities themselves.

At present there is no system in Canada to plan and coordinate cooperative wildlife research. Establishment of Cooperative Wildlife Research Institutes would ensure that research efforts are fully coordinated and would minimize duplication of effort.

The purpose of this paper is to review the operations and structures of existing organizations with similar goals in Canada and the United States. From an evaluation of those organizations, a model for the establishment of Cooperative Wildlife Research Institutes at Canadian universities is proposed.

SOME EXAMPLES IN THE UNITED STATES

There are institutions in the U.S.A. that are possible models. Two of those, Cooperative Fish and Wildlife Research Units and Cooperative National Park Resource Studies Units, will be considered in detail.

Cooperative Fish and Wildlife Research Units

The nationwide Cooperative Wildlife Research Unit (CWRU) program was established in 1935 to meet the need for trained personnel in the then rapidly-growing field of wildlife management and to provide better technical information for professional wildlife management programs

(Sparrowe 1982, Jantzen 1986). The following briefing statement, succinctly describing that program, was provided by the U.S. Fish and Wildlife Service.

"The Cooperative Fish and Wildlife Research Unit program currently consists of 36 Units at 33 Universities in 31 States. Nine of these are Fishery Units, five are Wildlife Units, and 22 are combined Fish and Wildlife Units. The present policy is to form combined Fish and Wildlife Units wherever separate Fishery Units and Wildlife Units have existed at the same university. The process of combination is nearing completion. All new Units are being formed as combined Fish and Wildlife Units.

Each Unit is a cooperative venture among the Fish and Wildlife Service, the State agency responsible for management of fish and wildlife resources, the university where the Unit is located and, in the case of Units with wildlife components, the Wildlife Management Institute. The major function of Units is to conduct research on high priority fish and wildlife resource problems and educate university graduate level resource professionals as part of the process. Fish and Wildlife Service biologists that staff each Unit provide a base of scientific support to form research teams and create synergistic research programs to solve natural resource problems of high interest to the cooperating agencies.

Each Cooperative Unit is governed by a Coordinating Committee composed of a representative of each of the cooperating agencies. The Coordinating Committee develops a directional statement for the Unit that provides broad program guidance to the Unit Leader who acts as the executive officer for the Unit. The committee meets at least once each year to review the on-going program of the Unit and provide direction for the ensuing year. Throughout the year the cooperators are contacted by the Unit Leader as is necessary to provide guidance for new research starts, etc., that cannot be dealt with at the time of the Coordinating Committee meeting.

Much of the research, though not all, is conducted through guidance of graduate students by Unit staff and faculty of the cooperating university. Some research is conducted by the scientists themselves without the involvement of graduate students. Research projects are funded either by funds being made available for specific projects by the cooperating agencies or by funds coming to the university from outside sources for research to be conducted through the Unit. The base Service funding for the Units in FY86 was approximately 4.5 million dollars, practically all of which is used for salaries. Base funds for research are not provided to the Units by the Service. Total annual expenditures for the program have recently approached 19 million dollars because of funds that are contributed to Units, through host universities, for conducting research projects.

Graduate students that work toward their degrees through the Units are selected for entrance to the program via the established graduate student selection procedure of the host university. The Units are viewed as an

integral part of the universities and Unit staff members hold professorships and graduate faculty appointments. The number of students within a Unit is dictated by available funding for research support and the time available for Unit staff to provide guidance. Unit staff handle similar numbers of graduate students as that expected for any university professor.

The Fish and Wildlife Service provides significant guidance for the type of research to be done by Units through formal and informal input to the Coordinating Committee and by making funds available for research on specific high priority information needs through regional offices, research centers, etc. Formal input is through the official representative to the Coordinating Committee but there is also a great deal of informal input provided through Service Regional office representatives that are invited to attend the annual Coordinating Committee meetings. Recent analysis of actual research being done at Units showed that nearly 80 percent of the on-going projects were being conducted on topics of significance to the Fish and Wildlife Service. The capability of the Units to help focus expertise of the various university faculties on topics of importance to the Service is an additional value to the Service. The research expertise of Unit personnel is considered an integral part of the research capability of the Service.

The Units are used extensively for providing technical assistance to the Service as needed to focus expertise and available information on specific problems. The ability of the Units to bring to bear the expertise of other university professors on specific problems of the Service is an additional benefit. The Units are frequently used for conducting workshops, symposia, in-service training for individuals, etc., and the expertise of other university faculty is frequently involved in these efforts. Consultations about specific Service problems are frequently conducted by Unit personnel and the cooperating faculties.

Graduate student education that is carried out through the Units has been, and continues to be, a major source for obtaining highly trained personnel for employment by the Fish and Wildlife Service, as well as by State fish and game agencies."

In addition to the base funding support of approximately $4.5 million for administration of the units, the U.S. Fish and Wildlife Service supports approximately $5.0 million of research which relates to its mandates. Therefore, about half of the total support for the CWRU program comes from that one agency.

Currently 32 states have CWRUs; eight other states have made applications to the U.S. Fish and Wildlife Service for similar units (W.R.

Goforth pers. comm.). Some states have not participated because they have their own research capabilities, because funding is not available, or because there are no graduate programs in wildlife management within their universities.

The CWRU program is a good idea whose value has been repeatedly demonstrated during more than 50 years of quality research, education and extension. It has graduated thousands of students who have entered all levels of governments, universities and the private sector. Currently, CWRUs are engaged in more than 600 projects, ranging from short-term studies by individual graduate students to sophisticated, interdisciplinary investigations involving many participants (U.S. Fish and Wildlife Service 1984). The natural resources of the United States are being well-served by that program which has powerful professional and political support.

Cooperative National Park Resources Studies Units

In the late 1960s, the limited number of scientists in the National Park Service (NPS) could not provide the natural and social scientific projects required by the Service; therefore a program of Cooperative Park Studies Units (CPSUs) was established in 1970 (Agee et al. 1983). The CPSU concept embraces teaching, research and extension on a cooperative basis with universities. The first unit was created at the University of Washington at Seattle. The NPS now has 13 active CPSUs in 8 regions, employing 33 staff. Funding for 1984 from NPS was approximately $2.2 million. It is not considered worthwhile to run a CPSU on less than $80,000 per year. A moderate sized CPSU of $150,000 to $250,000 per year was considered to give the best funding return.

The CPSU programs are based on the research needs identified in the Resources Management Plans, Visitor Use Plans, Interpretive Plans of each region's parks or as special regional needs. The activities at each institution are supervised by either a government or university scientist; in some cases the university scientist is a co-equal with a NPS scientist. The Regional Chief Scientist, who is responsible for the overall regional science program, coordinates the work of his park scientists with that of the CPSU's programs. That person is the contracting officer's representative for contracts let to each CPSU in the region, and is responsible for making the proper budget requests each year in order to fund the regional program.

In addition to conducting natural and social science research, the CPSU provides technical advice and professional services as required by the parks or regional offices (Johnson 1986). Furthermore, the CPSU program provides information for use in solving management problems and for the Resources Basic Inventory of each park.

Important reasons for having NPS scientists in colleges and universities are the opportunities they gain in teaching, participating in seminars and supervising graduate student research, as well as being stimulated toward excellence and exposure to new ideas. At the same time, association with researchers in all fields of science provides the NPS scientists with convenient access to information needed to solve today's complex natural and social resource problems--problems that must be investigated from a multidisciplinary approach. The large libraries and complex equipment required for such studies cannot be provided by each NPS park or region. Therefore, CPSUs provide invaluable resources for today's researchers, often through cooperation with universities.

A recent internal assessment of CPSUs found them to be productive and to make good use of a centralized workforce to produce benefits in a number of areas. They supplement the limited number of NPS scientists with a wide diversity of professional disciplines and provide cost-effective research. In terms of both effectiveness and efficiency, the NPS benefits greatly in having libraries, computers and staff available to meet its research needs.

SOME EXAMPLES IN CANADA

In an attempt to strengthen shared approaches to natural heritage research, planning and management, several universities and heritage agencies have recently developed cooperative programs. A few of these will be reviewed.

Heritage Resources Centre

In 1983, Environment Canada Parks (ECP) and the University of Waterloo initiated a 3-year pilot agreement to promote research, education and information pertaining to the planning and management of national parks and equivalent areas (Carruthers 1985a). ECP provided the salary of a liaison officer on campus, and a budget of $19,500 for a part-time secretary, student interns and some administrative costs. The University of Waterloo provided office space, word processing equipment, telephones and the assistance of 13 professors to attend monthly management meetings and work on cooperative projects. A recent evaluation resulted in extension of the pilot project for 2 more years, and the exploration of options for extending the program to other colleges and universities provided no new funds were required (Carruthers 1985b).

Despite rather meager funding, the accomplishments of the program are impressive. They include 24 public lectures; 13 related T.V. shows and video tapes; 6 occasional papers; 2 technical papers; 6 professional development workshops; establishment of a liaison office; staff exchanges; 3 sets of selected readings compiled and sent to park level staff; 22 student internships; increased number of studies undertaken at Waterloo University that are being directed towards the interests and needs of ECP; increased information sharing on a continuous basis; help with 2 ECP training sessions; a course booklet produced and distributed to ECP staff; 15 projects involving ECP funding; development of networking efforts with other universities throughout Ontario as well as with conservation agencies; increased individual efforts by university faculty in relation to ECP issues; and benefits to students by lecturing, counselling, consultations and stimulation of awareness and understanding of ECP and heritage conservation issues (Carruthers 1985b, J.A. Carruthers pers. comm.).

Carruthers (1985a) listed the benefits of the Heritage Resources Program as follows:

"...more knowledgeable graduates; constituency building; curriculum development; coordination and dissemination of research results; better utilization of academic resources; direction for university research; reference materials availability; funding sources; student placement; field study areas; more practical and meaningful graduate and under-graduate study programs; more "in-touch" professors; access to better research facilities and environments; a pooling of resources; cost-effective increased scientific productivity; training of park staff; interpretation and extension; environmental monitoring; problem solving; constant flow of information; specialized help; scientific review services; publications; input into planning and management decisions; among others."

Unfortunately, the liaison office does not have control of funds that could be used to stimulate research relevant to needs of ECP other

than through individually negotiated contracts. This is a major weakness of the program. Both Carruthers (1985b) and Meis (1986) have made recommendations for continuing and expanding ECP cooperative and collaborative arrangements with the universities. They have emphasized that senior management should view cooperation between ECP and universities as essential in realizing the long-term mandate of ECP as well as its shortand mid-term organizational needs.

Recently ECP signed cooperative agreements with Acadia University at Wolfville, Nova Scotia, and Memorial University at St. John's, Newfoundland, but neither liaison officers nor funding are provided by ECP under those agreements. Areas for possible resource sharing have been agreed to and ECP will maintain contacts through a field responsibility centre or a regional office.

The Natural Resources Institute, University of Manitoba

The Natural Resources Institute was established at the University of Manitoba in 1968 with a threefold mandate:

1) To teach resource management skills leading to the Master of Natural Resources Management degree.
2) To conduct applied research on current problems in natural resource management.
3) To provide a forum for examination of resource issues in order to raise the level of public awareness.

The Institute strives to direct the wealth of knowledge and experience in the university community to the resolution of resource problems. The objective of the program is to train professional resource managers who will have an understanding of the complex nature of natural

resources and the skills to manage them in the social and economic climate of the future (Natural Resources Institute 1986). Students are encouraged to develop an integrated view of all resources and an active understanding of the contributions of resource management to our economic well-being. Members of the University outside the Institute, as well as colleagues from all levels of government, industry and non-governmental organizations, are active in the work and funding of the Institute. Some federal and provincial government employees serve as adjunct professors.

The Natural Resources Institute was funded by the Ford Foundation for the initial 5-year period on the understanding that the costs in future years would be provided by the university. It currently has 3 full-time faculty members, 1 part-time member and about 12 other staff members who assist with approximately 50 graduate student projects. The present budget of the Institute is about $200,000 for administration and $400,000 for research. The principal benefits to funding agencies are quality reports at minimal cost and the opportunity to hire well-trained staff.

Westwater Research Centre, University of British Columbia

In 1971 the Board of Governors of the University of British Columbia (UBC) approved establishment of the Westwater Research Centre.

The Centre is guided by the following basic policies (Westwater Research Centre 1972, 1973):

1) To focus upon problems associated with preserving and enhancing the quality of the water environment.
2) To endeavour to provide an improved foundation for decisions about policies and institutional arrangements through studies of the water environment.

3) To seek to be a catalyst in conceptualizing and conducting interdisciplinary research.

4) To undertake research directed to the needs and interests of the people of Canada in general and of British Columbia in particular.

The Centre is a catalyst in cooperative efforts in multidisciplinary enquiries which extend beyond the scope of a single discipline. The general management of the affairs of the Centre is the responsibility of the Centre Council composed of residents of British Columbia appointed by the Board of Governors of UBC. An Executive Committee of the Centre appointed from the membership of the Council is responsible for day-to-day management of the Centre.

Where a government agency and the Centre have a common interest, they may enter into cooperative arrangements for research. Also, the Centre welcomes arrangements for assignment of employees from a public agency or a private organization to work on a Centre project. Noteworthy too is that much of the funding for the Centre, during the first 5 years of operation, came from an Environment Canada development fund grant. The initial funding was $180,000, reducing in later years. At the end of the first 5 years the Institute was responsible for finding other funding sources. The current budget of the Institute is approximately $500,000 with one-third coming from the University and two-thirds from various sources.

Students are employed as research assistants on the Centre's projects and may be supported for work on their Master's theses or Doctoral dissertations.

MECHANICS OF ESTABLISHING COOPERATIVE WILDLIFE RESEARCH INSTITUTES AT CANADIAN UNIVERSITIES

One of the more successful programs of those reviewed is the Cooperative Fish and Wildlife Research Units established by the U.S. Fish and Wildlife Service. This program should form the blueprint for developing a similar "Made in Canada" program that recognizes our social, legal and fiscal differences.

The remainder of this paper considers Cooperative Wildlife Research Institutes from the standpoint of purpose and objectives, benefits to be gained, number required and distribution, staffing, funding arrangements, management and evaluation.

Purpose and Objectives

Cooperative Wildlife Research Institutes would provide management agencies with research required to maintain and manage wildlife populations at appropriate levels, and which the agencies could use to promote the wise use of wildlife[1] through sound management and education as set forth by the World Conservation Strategy (International Union for the Conservation of Nature and Natural Resources 1980) and Guidelines for Wildlife Policy in Canada (Minister of the Environment 1982). The purpose of the Cooperative Wildlife Research Institutes would be to solve specific, current and anticipated management problems with mission-oriented research reflecting a primary concern with the social and economic values of wildlife and allied resources. Cooperative Wildlife Research Institutes

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[1]All non-domesticated animals, including their habitats, but excluding fishes. Fishes were excluded because they are not within the mandate of Environment Canada and because their management is the responsibility of several different agencies within federal, provincial and territorial governments.

would be associations of researchers, educators and graduate students with interests in mission-oriented wildlife research. The goal of such Institutes would be to provide wildlife related benefits to the public through quality research.

Proposed objectives are:

1) To undertake cooperatively supported research to solve problems related to the production, use, protection and restoration of wildlife populations, thereby enhancing the capacity of federal, provincial and territorial governments and other agencies to manage wildlife resources and their habitats.
2) To enhance understanding of the aesthetic and economic values of wildlife by investigating their socio-economic aspects and exploring ways of maximizing them.
3) To train technical and professional staff, primarily at the graduate level, in the fields of wildlife research, wildlife management, ecology and environmental studies; and to provide retraining opportunities for staff of wildlife agencies.
4) To develop integrated resource research teams to study multidisciplinary problems of managing lands for timber, wildlife, water, agriculture, recreation and other socio-economic needs.
5) To make recommendations based on research findings to governments, industry, landowners, other organizations and various wildlife users.
6) To provide advice and conduct research on wildlife management problems in developing countries, as requested; and to provide advanced training for wildlife managers from those countries, as the need arises, in cooperation with Canadian international development assistance programs.

7) To develop cooperative research programs on transboundary wildlife populations with other countries and agencies.

Cooperative Wildlife Research Institutes should comply with the best traditions of academic research. They should adhere rigorously to scientific methods and reflect high standards of objectivity. They should not seek to monopolize wildlife research in a region, but should welcome and encourage research by others. Cooperative Wildlife Research Institutes should be oriented towards management rather than the pursuit of knowledge for its own sake. It is important that participating universities recognize that the basis of involvement by wildlife agencies in such cooperative activities is fundamentally one of self-interest (Maxwell and Currie 1984). A special effort should be made by each Cooperative Wildlife Research Institute to work with all interested parties in deciding upon research needs and in providing information on research results. Cooperative Wildlife Research Institutes will create a stimulating environment that encourages spontaneity, perpetuates innovation and provides the means to put ideas into action. Faculty participation would be voluntary; academics, other than the Institute director, will work with, not for, the Institute. Topics worthy of study would be a matter of negotiation with participating agencies.

Benefits to be Gained

The benefits to be derived from closer working relationships among governments, universities and others by the establishment of Cooperative Wildlife Research Institutes are numerous. Advantages would include, but are not limited to, the following:

1) New funds would be attracted to support research. For example, the U.S. Fish and Wildlife Service funding of $4.5 million for administration and about $5 million in support of its own research needs at CWRUs during 1986 resulted in a total research expenditure approaching $19 million. Similar leveraged opportunities should be possible in Canada.
2) Association among universities, government agencies and the private sector would enhance the application of rigorous scientific methods to mission-oriented research.
3) The proficiency of wildlife agency staffs would be enhanced, and staff perspectives broadened, by association with the university community. Similarly, the experience of university students and staff would be enhanced by exposing them to applied research and management, thus complementing the theoretical knowledge received in formal courses.
4) These Institutes in conjunction with a national steering committee would provide a mechanism for the stimulation and coordination of multidisciplinary wildlife research in Canada; no such mechanism presently exists.
5) Sharing of equipment and facilities - including computers, libraries and expensive almost "one of a kind" equipment - would reduce costs.
6) Cooperative Wildlife Research Institutes would provide training for biologists and land managers from developing countries funded by agencies such as World Wildlife Fund, World University Services Canada, Canadian International Development Agency, International Union for Conservation of Nature and the Food and Agriculture Organization.
7) Research projects would be less expensive than those of government because much work would be done by graduate students at less cost than

comparable personnel outside the university. Also, there would be no additional charges to governments for project review and supervision by professors.

8) Cooperative agreements between universities and other institutions, some not available to governments, could be utilized by Cooperative Wildlife Research Institutes.

9) University "overhead" normally charged to government contracts may be reduced or eliminated by negotiation.

10) Cooperative Wildlife Research Institutes can offer a great diversity of expertise not normally available within a single government agency. They can draw on faculty and students from a number of different disciplines, for short- or long-term, complex research projects or for consulting.

11) Institutes would enhance university instructional programs through part-time teaching assistance by Cooperative Wildlife Research Institute personnel.

Number Required and Distribution

Cooperative Wildlife Research Institutes could be established on a regional, national, centre of excellence or ecological/geographical basis. Since many wildlife research needs are regional in nature, the establishment of Cooperative Wildlife Research Institutes on a regional basis is recommended. Regionalizing on an ecological/geographical basis is not considered feasible because provincial and territorial boundaries do not coincide with ecological/geographical ones. Initially, 5 Cooperative Wildlife Research Institutes should be established for a 10-year experimental period at universities that currently have strong

interests in natural resource management. It is suggested that Cooperative Wildlife Research Institutes be distributed to serve British Columbia/Yukon; the Prairie Provinces/Northwest Territories; Ontario; Quebec; and Newfoundland/Maritime Provinces.

Staffing

The CWRUs in the United States and the Heritage Resources Program at the University of Waterloo are staffed by federal government employees. A number of advantages stem from government involvement including knowledge of their operations, potential funding support and identification of national research needs. In the U.S.A., some CPSUs are operated with federal staff and some are operated without, although a recent assessment indicated they would function more efficiently with the presence of federal employees (Carruthers 1985a).

The Minister of Environment Canada, under section 3(c) of the Canada Wildlife Act, could assume leadership in wildlife research by offering to second staff members as Institute directors, at least for the initial experimental period of 10 years. Although the salaries and benefits of the directors would be provided by Environment Canada, each director should have a faculty appointment, be responsible to the university department concerned and be fully integrated into the university system. Setting of goals and an annual appraisal for each director should be undertaken jointly by the responsible university department head and a director of the Canadian Wildlife Service. A standardized agreement should be prepared for the establishment and operation of Cooperative Wildlife Research Institutes. It should be sensitive, simple and general enough to allow variation in arrangements at different universities.

Environment Canada could meet personnel requirements by secondment of present staff, provision of new person years, activation of the Public Service assisted arrangement for University Senior Research Fellowships or possibly through Industrial Research Chairs of the Natural Sciences and Engineering Research Council.

Directors of Cooperative Wildlife Research Institutes should be selected carefully in concert with the universities and other cooperators. Candidates should have demonstrated administrative skills, the ability to generate outside funding, and academic and scientific credentials acceptable to universities. A high level of communication skills will be essential to establish networks among governments, universities, the private sector and national interest groups. The directors should serve primarily as facilitators of the research of others. Staff members from all cooperating wildlife agencies would be encouraged to participate in multidisciplinary research projects based at the Institutes, either on a temporary basis or as part-time participants. Depending on their level of training, experience and their acceptability to the university, they could be appointed as research associates or adjunct professors.

Funding Arrangements

The research programs of the Cooperative Wildlife Research Institutes would consist of three parts, each of which would require funding as follows:

1) Administration, provided by an Institute director with an office, secretary and administrative support.
2) A core program of long-term research coordinated by the Institute using graduate students, contractors and research associates.

3) Special research projects as part of the ongoing activities of each Institute to be conducted by graduate students and others in affiliated universities in response to the priority needs and in support of industry and government.

Parts 1 and 2 would be most efficiently met by annual core grant funding. The minimum requirement for the successful operation of a Cooperative Wildlife Research Institute is estimated at $125,000 per year if the directors were seconded and salary and benefits provided by Environment Canada, or $200,000 per year if staff are recruited through the universities. In addition, $50,000 for capital expenditures would be required for the first year only. In recognition of the national and international significance of wildlife, Environment Canada should be responsible for the annual core funding, the initial capital requirement and for negotiating the initial agreements with the participating universities. The amount of federal core funding should be considered as a minimum target to be matched or exceeded by other cooperators.

Housing of the Cooperative Wildlife Research Institutes should be provided by the university associated with each Institute. In addition, each university should provide access to the library, mainframe computer, storage and other special facilities as defined and agreed. Such services, in addition to faculty members' time, are a distinct and measurable cost to the universities and would constitute a significant financial contribution from the university community in support of wildlife research.

Grants and contracts with industry, governments, conservation organizations and foundations with specific wildlife management concerns and research needs would be used to fund Part 3 special research projects.

The financial support of provincial and territorial governments should be voluntary. The amount of funding that might be provided would vary with the research needs of each agency and its in-house research capability. In the United States, one state contracts with the CWRU for all its research needs, other states use CWRUs hardly at all, but most states fall between those extremes (Jantzen 1986). Provincial and territorial governments should be required to contribute only to projects that they are interested in and should not be expected to cover general administrative costs.

The potential for support from cooperating federal government agencies is not limited to the Canadian Wildlife Service. ECP, Agriculture Canada, Canadian Forestry Service, Fisheries and Oceans and Indian and Northern Affairs Canada all have wildlife-related research needs that from time to time could be addressed by the Institutes.

Potential cooperators and supporters among non-government agencies include the Canadian Wildlife Federation, Ducks Unlimited Canada, Wildlife Habitat Canada, World Wildlife Fund (Canada) and Delta Waterfowl Research Station, among others, and a wide range of foundations and industrial organizations.

Management

Since the Cooperative Wildlife Research Institutes are to be run as a national program, there should be a national steering committee as well as a management board for each Institute. Establishing policy guidelines and providing leadership on setting priorities should be the main responsibilities of the national steering committee. In addition, the steering committee should coordinate activities of the proposed

Institutes by providing overall direction and evaluation. The national steering committee should be composed of 7 members - 2 from the federal government, 2 from provincial or territorial governments, 2 from universities and one from a financially-supporting, non-government organization. It could be an independent committee reporting annually to the Federal-Provincial/Territorial Wildlife Conference.

Each Cooperative Wildlife Research Institute should be governed by a management board composed of representatives from the university, governments and non-government entities which contribute to it. The chairman of the board would be selected from the contributing members and the Institute director would be an ex officio member. The duties of the management board will be as follows:

1) To establish policy and direction for the Institute, subject to the broad guidelines of the national steering committee.
2) To solicit, accept and allocate funds.
3) To determine research priorities for the Institute.
4) To facilitate and coordinate research of the Institute.
5) To report annually, through the chairman of the management board, to the dean of the affiliated university faculty, to the national steering committee and to other participating organizations.

Evaluations

The Cooperative Wildlife Research Institutes should be subject to an extensive evaluation after 5 years of operation to determine if there are needs for significant redirection over the next 5 years. A final evaluation at the end of the 10-year period will assist in making a

decision to extend the program by renegotiating the agreements with the universities, to cancel the program, or to expand to other universities. One of the principal functions of the national steering committee would be to arrange for these evaluations.

CONCLUSIONS

A major thrust of governments today is to encourage increased involvement of other organizations in their activities. The Cooperative Wildlife Research Institute concept responds well to that thrust. The synergistic effect on funding and production of results from similar cooperative activities is well documented. Given the present circumstances of fiscal restraint within governments, closer working relationships among organizations and a pooling of expertise and financial resources is becoming increasingly important.

What better way would there be to celebrate the first century of wildlife conservation in Canada than by establishing Cooperative Wildlife Research Institutes at Canadian universities to provide the information base necessary for wildlife conservation and management during the second century? Such an information base is essential if the contributions of wildlife resources to society are to be maintained or increased and if the goals of sustainable development are to be realized.

It is, therefore, strongly recommended that Environment Canada assume national leadership to initiate and support establishment of at least 5 Cooperative Wildlife Research Institutes in Canada with the support of other levels of government, universities, wildlife organizations and the private sector.

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